Information--The Fifth Element of Combat Power

A Monograph
by
Major George J. Franz
Military Intelligence

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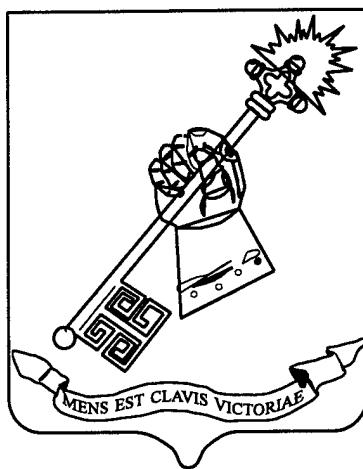
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The monograph examines emerging information operations (IO) doctrine contained in FM 100-5, Operations, FM 100-6, Information Operations, TRADOC Pamphlet 525-5, Force XXI Operations--A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-First Century, and related publications. It analyzes the current model and defines the integral elements of combat power and the conditions that affect their application. In turn, the study identifies the current elements of combat power that are included in information warfare (IW) and distinguishes those aspects of IO not imbedded in the current combat power model. Detailing the components of IW and surveying current Army doctrine regarding information operations builds a foundation for examining the historical case study and for examining proposed future doctrine.

A historical case study of Operation DESERT STORM provides the groundwork for considering the role information plays in the current combat power model. The analysis of the contemporary paradigm and the historical examination of IO combined with an overview of emerging concepts developed to support Force XXI affords a thorough basis for establishing a new framework. This allows for development of a new formula, based on the foundation of the current combat power model, Colonel Huba Wass de Czege's 1984 Understanding and Developing Combat Power. The DESERT STORM historical analysis contributes to the examination of Colonel Wass de Czege's theoretical concepts by providing an analysis of the "real-world" application of his concepts. This study proposes that information operations have fundamentally changed the basis for the combat power model and argues for the development of a new archetype.

From the monograph, a new combat power model emerges with information operations becoming the fifth component of combat power: a detailed analysis using Wass de Czege's methodology supports this doctrinal change. Optimally, the updated paradigm provides the basis for continued discussion, analysis, and debate within the Army, as we struggle to meet the challenges of "Information-Age" conflict.

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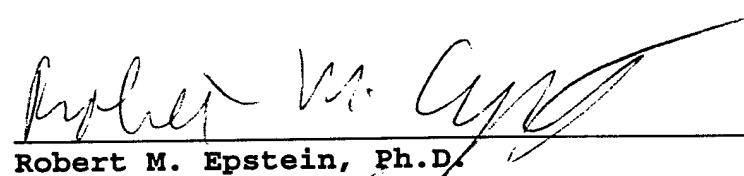
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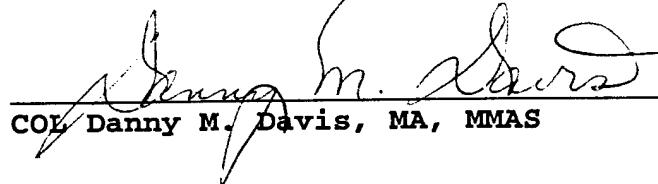
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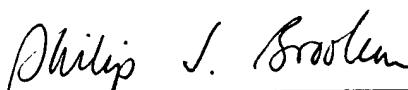
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Section I--Introduction.

In a November 1995 address to the Fletcher School of Law and Diplomacy Army Chief of Staff, General Dennis Reimer, presented his observations concerning the Revolution in Military Affairs (RMA), its relation to Force XXI and his thoughts on the Army of the future. In this address, he made four key points regarding the nature of the current RMA. First, the ongoing Information Revolution centering on the ability to collect, analyze, disseminate, and act upon battlefield information has become a dominant factor in warfare. Second, technological superiority alone is not decisive; a balance of quality people, training, leadership, doctrine, and equipment is required. Third, the four tenets of the Revolution of Military Affairs are precision strike, information warfare, space warfare, and dominating maneuver. Finally, Force XXI projects the Army into the 21st Century and provides the appropriate doctrine and organizations to achieve decisive victory in future operations across the spectrum of conflict. [1]

General Reimer and many other Army senior leaders, including his predecessor, General Gordon Sullivan, consistently emphasize the importance of doctrine as the primary intellectual tool for guiding the Army through change into the Information Age. As General Sullivan stated in his 1993 article, "Land Warfare in the 21st Century":

> The US Army must develop information warfare and warfighting doctrine that will enable it to achieve the same information dominance it maintained during the D-Day invasion and Desert Storm. This information overmatch allowed the US and its allies to achieve victory then, and can prepare the Army to fight successfully in wars of the future. The US Army must develop a combat power model that allows it to win the battlefield information war, as an integral element of its operations. [2]

Challenged by visionary leaders like Generals Reimer and Sullivan, the Army has begun to develop theoretical underpinnings for fighting future wars. The Army's principal

document regarding future warfare, <u>TRADOC PAMPHLET 525-5, Force XXI Operations,</u> <u>A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the</u> <u>Early Twenty-First Century</u>, provides the doctrinal base. Besides introducing the Army's vision for 21st Century force development and operations, <u>TRADOC Pamphlet 525-5</u> also presents the conception of information operations and highlights the important role information warfare will play in Army operations during future conflict.

Complimenting <u>TRADOC Pamphlet 525-5</u>, <u>FM 100-6--Information Operations</u> provides the detailed basis for training, planning, and executing information operations (IO), a central element in developing Army doctrine. This manual defines the basic elements of IO and provides the foundation for integrating information into other aspects of Army operations. <u>FM 100-6</u> recognizes the unique and significant impact that information has under current conditions and will have on the future battlefield, not only in an enabling role but as a means for the commander to dominate his opponent. <u>FM 100-6</u> reevaluates one of the Army's central theoretical constructs and espouses the addition of information operations as a primary component of combat power; this would modify an underlying doctrinal concept and would fundamentally alter the way the Army views warfare. [3]

While <u>TRADOC Pamphlet 525-5</u> and <u>FM 100-6</u> contribute basic plans for transition within the Army, their impact on the development of future warfighting concepts remains limited. Until the Army's overarching guide for operations, <u>FM 100-5</u>, changes the impact of these documents will be marginal: "As the Army's keystone doctrine, <u>FM 100-5</u> describes how the Army thinks about the conduct of operations. <u>FM 100-5</u> undergirds all the Army's doctrine, organization, training, material, leader development, and soldier concerns." [4] For

the Army to effectively make the transition into the future, revision must be made to the keystone operational doctrine contained in FM 100-5.

One of the Army's major doctrinal concepts, combat power, requires modification to keep pace with the changing environment of conflict. Combat power represents the relative measure of the Army's effectiveness versus its opponent. Along with the principles of war and the tenets of Army operations, it forms the foundation for all Army doctrine. [5] The Army's Combat Power model, defined as the combined effects of maneuver, firepower, protection, and leadership, represents one element of the Army's foundation that must be updated to meet the requirements of modern warfare. The current combat power model fails to recognize the impact that the current Revolution in Military Affairs, specifically embodied in the emergence of Information Operations, has on today's Army and will have on the Army of the future.

The challenge is to determine how this basic Combat Power Model must progress to reflect the revolutionary way that Force XXI will fight "future wars that are descendants of the past: World War II, Korea, and Desert Storm." [6] One methodology suggests that the Army shift away from a doctrine foundation based on maneuver and firepower to a conceptual model that includes information based operations as an equal component of modern warfare.

History provides a reference point for studying the change and evolution of warfare. Accordingly, by examining the execution of Information Warfare during one of the Army's most significant and successful operations, DESERT STORM, we may analyze the increasing importance and impact of information warfare on this campaign. Understanding the information dynamic existent during this conflict leads to an awareness of its effects on

operational Combat Power. The historical and doctrinal analysis allows the introduction of a new Combat Power Model that reflects the changing environment of warfare and the current and projected US Army information warfare capabilities.

How does combat power relate to information warfare? To answer this question, one must first establish the basic framework for analyzing information operations by identifying the primary doctrinal elements of combat power and their relationship to information warfare. Analyzing the current model defines the integral elements of combat power and the conditions affecting their application. This, in turn, identifies the current elements of combat power that are included in information warfare and distinguishes those aspects of information operations not imbedded in the current combat power model. Detailing the components of information warfare, identifying the primary components of IW, and surveying current US Army doctrine regarding information operations builds a foundation for examining the historical case study and for examining proposed future doctrine.

While the study of history may reveal no specific scientific lessons, it allows us to build on this basic doctrinal knowledge by establishing a sound base for examining the cause and effect relationship between information operations and combat power. What is the link between Operation DESERT STORM and the present nature of warfare? Seeking to answer this question invites an analysis of information operations conducted during the US Army's first major post-industrial era conflict. This campaign marks a significant shift in the application of information warfare during combat. DESERT STORM was the first conflict where the tenets of the RMA, precision strike, information warfare, space warfare, and dominating maneuver, were applied to an operational campaign. The US Central Command, comprised of Army, Air Force, Navy and Marine forces, utilized information operations in

conjunction with the application of firepower and maneuver to achieve an overwhelming victory. The Air Force, in a synchronized and coordinated effort, attacked and disabled the Iraqi information capabilities. The Air Force's "Air Campaign" employed operational fires and maneuver to enable information warfare. The ground forces then successfully conducted a massive invasion that quickly encircled and destroyed a majority of the Iraqi Army. While the Air Force also conducted bombing support for the Army, an important contribution made by air power was in the realm of information warfare. The combined ground and air force's information operations constituted the first campaign in the era of knowledge based warfare. The success of their actions may be used as a model to propel the Army into the future.

The historical case study provides the groundwork for considering the role information plays in the current Army Combat Power Model. The analysis of the contemporary combat power model and the historical examination of information operations combined with an overview of emerging concepts developed to support Force XXI affords a thorough basis for establishing a new framework. This allows for development of a new formula, based on the foundation of the current combat power model, Colonel Huba Wass de Czege's 1984 Understanding and Developing Combat Power. The Desert Storm historical analysis contributes to the examination of Colonel Wass de Czege's theoretical concepts by providing an analysis of the "real-world" application of his concepts. This study proposes that information operations have fundamentally changed the basis for the combat power model and argues for the development of a new paradigm.

What is the result of this analysis? A new combat power model emerges with Information Operations becoming the fifth component of combat power: a detailed analysis using Wass de Czege's methodology supports this doctrinal change. The refined model

includes the second and third tier factors, providing a detailed rationale for each element of the IO function. Optimally, the updated paradigm provides the basis for continued discussion, analysis, and debate within the Army, as we struggle to meet the challenges of Information Age conflict.

SECTION II--INFORMATION WARFARE AND COMBAT POWER DOCTRINE.

What is the specific relationship between Information Operations and Combat Power? Fundamentally, no subject will have more impact on the emerging Army of the 21st century than the role of information in warfare. As data technology permeates and revolutionizes the way all aspects of society function, scrutiny of its effect on military operations must be conducted. Failure to do so risks putting our Army at odds with the conditions under which we will fight and at the mercy of enemies who have made the shift into information age warfare.

Information Operations must be examined in relation to the central concept of combat power. Since relative combat power is the universally accepted means of measuring an army's potential effectiveness on the battlefield versus that of its opponents, in the future this capacity will be greatly affected by the force's ability to dominate the information dimension of conflict. Information Operations and Combat Power, examined concurrently and systematically, form the basis for future doctrine; these concepts will determine how we study wars of the past, practice our profession in the present, and think about fighting war in the 21st Century. [7]

Information Warfare Doctrine

Information warfare integrates the use of intelligence, operations security (OPSEC), military deception, psychological operations (PSYOPS), electronic warfare (EW), and

physical destruction in order to deny the enemy use of information while protecting friendly capabilities. [8] Information operations enable, enhance, and protect the commander's decision making capacity while degrading, destroying, or disrupting the enemy's C2 systems. Information operations are conducted across the full range of military operations at all levels of war. [9] IW achieves its objective by denying the enemy the information needed to make sound decisions (OPSEC), influencing the decisions that the enemy makes (deception and PSYOPS), and degrading or destroying the enemy's command and control (C2) systems (EW and physical destruction). The synergistic use of the five elements of IW provides the commander with the potential to decisively defeat an enemy. [10] Understanding each component of IO is critical to further examination of its impact on operational Combat Power.

Effective information warfare depends on intelligence, the vital information regarding the enemy situation and battlefield conditions, which the commander must have to conduct successful operations. It is a critical element of planning, security, and deception. Intelligence must be clear, brief, relevant, and timely. Intelligence supports the commander's ability to make decisions on the battlefield by allowing him to "see the enemy" and to "visualize the terrain and weather." Without timely and accurate information regarding the enemy, the commander cannot make informed decisions, allowing the enemy to set the conditions for battle. [11]

The effectiveness of IO is predicated on a thorough understanding of the enemy, his C2 system, and his decision making process. At all levels of war, intelligence is an operational tool that identifies, assesses, and exploits the enemy's information and C2 systems. Intelligence operations facilitate electronic preparation of the battlefield,

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development of IW courses of action by defining the enemy C2 high payoff targets, and assessment of the effectiveness of the IW campaign. [12]

Closely related to intelligence, Operations Security denies the enemy intelligence information about friendly intentions and capabilities needed to make decisions. Current OPSEC doctrine emphasizes five steps that apply to campaign planning. Efficient operations security requires continuous identification of friendly information to be protected, analysis and knowledge regarding the enemy collection threat, analysis of friendly vulnerabilities, risk assessment, and planning and application of appropriate countermeasures. These procedures establish a clear relationship between OPSEC and intelligence, EW, counterintelligence, direct action, and deception. [13]

Military deception combines aspects of intelligence and operations security to purposely "mislead enemy decision makers by distortion, concealment, or falsification of indicators of friendly intentions, capabilities, or dispositions." [14] The object of battlefield deception is to cause poor decisions by the enemy commander, resulting in actions that can be exploited by friendly forces.

Deception that exploits the enemy's preconceived notions of what friendly forces are likely to do is most effective. Demonstrations and feints can reinforce this perception and force the enemy to remain constantly on guard, wearing down his vigilance and reducing the enemy's alertness. Deception is supported by controlling the enemy's access to certain data and by feeding controlled information on deception related events. This causes the enemy to seize on the false intelligence, believing that he has ascertained the true objectives of the friendly plan. These bogus activities must be protracted to ensure the deception lasts as long as possible, causing the enemy to believe that the false action is continuing even after the real

operation has commenced. [15]

To be effective deception must be supported by precise and timely intelligence that provides accurate feedback. The commander must ascertain that the enemy is actually receiving the false information and is taking actions that indicate he believes the deception story. Influencing the enemy's perceptions by jamming, OPSEC, and Physical destruction of key enemy collection assets is a critical elements of deception operations and demonstrate the interdependence of these elements of IW. The DESERT STORM case study discussed later in this paper illustrates a successful deception campaign.

The fourth component of IO, Psychological Operations, attempts influence foreign (neutral or enemy) attitudes and behavior favorable to friendly objectives. PSYOPS derive their chief effectiveness from being part of an integrated IW operation and should be used to support a commander's deception plan and to target audience intelligence. Initially, PSYOPS elements contribute to the deception effort by identifying enemy cultural, social, and political factors susceptible to deceiving and later by anticipating enemy reactions to the ruse. PSYOPS assets are often used to convince enemies that they should surrender or to protect civilians by keeping them away from areas of combat activity. PSYOPS can also amplify the effects of military operations, diminish enemy morale or reduce their will to resist, sustain the morale of resistance fighters, support deception operations, and use mass media to influence target audience behavior. [16]

As the fifth component of information operations, Electronic Warfare attacks the electromagnetic portion of the enemy's command and control system while protecting the friendly commander's. Electronic warfare involves the systematic application of electronic attack, electronic warfare support, and electronic protection to achieve the desired battlefield

effects. EW protects friendly C2 capabilities and attacks the enemy's C2 capabilities while simultaneously providing enabling capabilities to intelligence. [17] As armies become increasingly dependent on the electromagnetic spectrum to provide information and communications capability, EW emerges as a critical component of C2 operations.

Electronic attack primarily includes the use of non-lethal fires (jamming) to disrupt, damage, or destroy the enemy's C2 and targeting systems. Jamming is often a crucial element of deception operations and PSYOPS. Electronic support is the process of intercepting, locating, and exploiting enemy communications and non-communications emitters. This provides the commander with combat information and intelligence to make decisions, to determine the enemies' intentions or reactions to friendly deception, and to provide targets for attack through direct action, jamming, or PSYOPS. Electronic protect closely relates to OPSEC and includes measures taken to prevent the enemy from obtaining friendly electromagnetic emissions while maintaining our own. This process includes electronic deception to hide actual C2 node locations and management of the electromagnetic spectrum to assure efficient use of available assets. [18] EW is most effective when coupled with some type of destructive action.

Finally, physical destruction as a specific component of IW includes direct attacks against enemy sensors, processors, communications, and command and control nodes. In the context of counter-C2, physical destruction disables or destroys enemy sensors, processors, communications, and C2 nodes. Targeting these systems results in denial and delay of information to the enemy commander. [19]

The goal of IW operations is to establish an overwhelming information advantage, resulting in "Information Dominance." [20] Friendly command and control and intelligence

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systems operate effectively while the enemy's are rendered ineffective. As with the combat power model the attainment of information dominance is relative to the enemy. There is no absolute information condition and the balance may shift. Current information operations doctrine identifies and codifies the emerging importance of information on the battlefield. Additionally, it clarifies the vital and equal contribution information makes in conjunction with firepower, maneuver, protection and leadership in the development of combat power.

Combat Power

What is combat power and how does this concept relate to information warfare? Combat power is a comparative measure of an army's or a unit's effectiveness versus its opponent's resulting from the combination of maneuver, firepower, protection, and leadership. Along with the principles of war and the tenets of Army operations, it forms the foundation for all doctrine. FM 100-5 describes the intended result of its application, stating, "Overwhelming combat power is achieved when all combat elements are violently brought to bear quickly, giving the enemy no opportunity to respond with coordinated or effective opposition." [21] Understanding the principles regarding combat power and information warfare provides a sound basis for conducting a historical analysis of US Army doctrine regarding both.

The basis for the FM 100-5 concept of combat power is Colonel Huba Wass de Czege's Understanding and Developing Combat Power. (See Appendix A for the expanded version of General Wass de Czege's Combat Power Model.) In 1976, Wass de Czege designed a paradigm to describe the factors determining the outcome of operations; his Relative Combat Power Model became part of Army doctrine in 1984 and "has remained a core concept of our operational thought." [22] As he explains, WASS de CZEGE intended for

his model to achieve two purposes:

> This analytical framework can aid the development of concepts and doctrine in two ways. First, it can be used to assess current doctrine in light of new developments to insure that it serves to guide actions in such a way as to maximize combat power. *Second, it can serve as a vehicle for communicating the need for any necessary changes thus identified* [Author's emphasis] [23]

As portrayed in FM 100-5, this simple model contains only four elements: firepower, maneuver, survivability, and leadership. The analytical model contained the following equation:

THE RELATIVE COMBAT POWER MODEL

$$L_f(F_f + M_f + S_f - D_e) - L_e(F_e + M_e + S_e - D_f) = \text{The Outcome of Battle}$$

L_f - friendly leadership effect

F_f - friendly firepower effect

M_f - friendly maneuver effect

S_f - friendly survivability effect

D_e - enemy degrading of friendly (Firepower, maneuver and survivability effects)

L_e - enemy leadership effect

F_e - enemy firepower effect

M_e - enemy maneuver effect

S_e - enemy survivability effect

D_f - friendly degrading of enemy (Firepower, maneuver and survivability effects) [24]

The equation form of the model helps to understand the factors' relationships. It identifies leadership as the main force that integrates maneuver, firepower, and survivability effects at the decisive point. Success depends on maintaining greater relative combat power than the enemy.

One useful aspect of the model is the additional explanation that provides a practical framework for its use by planners. The second and third levels add more detail and solidity to the concept. The first level containing the four elements was incorporated into Army doctrine starting with the 1982 edition of FM 100-5 and has remained in all subsequent manuals.

The first element of the FM 100-5 model, maneuver, concerns the positioning of combat forces to deliver or to threaten to deliver direct and indirect fires. Positioning of forces at decisive points on the battlefield allows the commander to achieve surprise, psychological shock, momentum, massed effects, and moral dominance. Maneuver effect can also be obtained by allowing the enemy to position its forces in a disadvantageous position. According to the current FM 100-5, maneuver is rarely effective without firepower and protection. Additionally, the positional advantage and staying power gained by ground maneuver forces cannot be replaced by other means. [25]

The second and third tiers of the Wass de Czege model detail the relationship between information and maneuver. Maneuver incorporates unit mobility, tactical analysis, and Command, Control, and Coordination (C3) capabilities. Each of these subordinate areas relates to a corresponding element of Information Operations. Unit mobility is a function of teamwork, espirit, and health; PSYOPS enhances and protects friendly forces capabilities while attacking the enemy's. Within the Tactical Analysis sub-function, intelligence regarding enemy, terrain, and weather influence maneuver. Additionally, command, control, and coordination contribute to the maneuver effect; the ability to successfully achieve this C3 function while preventing the enemy from doing the same is the heart of Information Operations. While recognizing information as an element of maneuver, the Wass de Czege model establishes these critical capabilities as secondary supporting functions. [26]

FM 100-5 considers firepower essential to defeating the enemy's ability and will to fight. It is the amount of fire that can be delivered by a weapons system or unit; this includes the fire support functions that can be used in combination with maneuver to destroy the enemy. To achieve maximum firepower effects, the commander must integrate the full

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effects of locating, identifying, and tracking targets and of assessing fire effects. Firepower is most effective when combined with maneuver forces. [27] The detailed combat power model further defines firepower as the result of the combined effects of volume of fire, lethality of munitions, accuracy of fires, target acquisition, and flexibility of employment. [28]

FM 100-5 includes electronic warfare as an integral component of firepower. Within the sub-components of firepower, Wass de Czege integrated information into the supporting target acquisition function. This function incorporated the tasks of intelligence analysis, location and functioning of observers and sensors, and the transmission of target data. These tasks primarily focused on friendly efforts to acquire, process and disseminate information about the enemy. Intelligence and intelligence analysis are enabling elements of target acquisition, which facilitates the firepower effect.

Protection preserves the fighting potential of a force. Protection considerations include OPSEC, basic maintenance of soldiers and equipment, safety, and fratricide avoidance. FM 100-5 emphasizes the friendly oriented measures taken to maintain forces, placing little emphasis on defeating the enemy information gathering and command and control systems. [29]

Within the Wass de Czege model, OPSEC, EW, counterintelligence, and deception facilitate concealment which contributes to the protection effect. OPSEC and deception are included as second tier supporting components only. The role of information within the element of survivability primarily concerns actions taken to prevent enemy acquisition of friendly information. The protection effect includes efforts taken to counter enemy intelligence acquisition as well as measures to reduce the signature of friendly forces. It seeks to limit exposure by implementing measures to minimize target size, target exposure time,

and to complicate potential enemy target tracking. The negative or protective aspects of these components are stressed, minimizing the role the positive and offensive capabilities that they may contribute.

Leadership is the most dynamic essential of combat power. Leaders provide purpose, direction and motivation, determining how each of the other elements of combat power will be applied on the battlefield. Leadership is exercised through direct contact with soldiers as well as through the command and control systems and facilities. Effective leadership on the battlefield depends on the commander's ability to employ his technical proficiency, understanding of unit capabilities, analytical skills, communications skills, moral force, and understanding of battlefield effects at critical times and places. [30]

While neither FM 100-5 nor the Wass de Czege Combat Power Model specifically address the role of information in the leadership function, FM 22-100, Military Leadership, clearly defines this relationship. The commander's ability to apply the maneuver, firepower, and protective effects of combat power effectively on the battlefield depend on accurate and timely information; this information is the basis upon which the leader makes and communicates decisions. The leader cannot function without information. [31]

While Wass de Czege's model does not specify information operations as a primary component of the first level, equal in importance to firepower, maneuver, survivability and leadership, it does include information into the subordinate echelons of the model. Individual components of IO are addressed, however, no systematic application of information warfare is proposed. Furthermore, these concepts are considered only as functions which enable maneuver, fires, protection and leadership. The "value added" of combining the informational elements to achieve a discreet and decisive battlefield outcome is not

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considered.

Finally, FM 100-5 states that the effective application of combat power decides the outcome of campaigns, major operations, and battles. [32] Therefore, the combat power model offers a lens through which to examine one of the US Army's most significant operations, DESERT STORM. Additionally, this paradigm supports an evaluation of the role of Information Operations during this campaign. Such analysis determines whether the traditional combat power model accurately reflects the contribution that information operations played in this decisive US victory.

SECTION III--CASE STUDY: Operation DESERT STORM.

Operation DESERT STORM provides a contemporary opportunity to study the evolving role of Information Warfare in the development of operational combat power. DESERT STORM represents the first conflict in which the tenets of the RMA including precision strike, information warfare, space warfare, and dominating maneuver were applied to an operational campaign. In this most recent contest Iraq lost the "war of knowledge" well before the first coalition ground forces entered Kuwait. The US Central Command (CENTCOM), comprised of Army, Air Force, Navy and Marine forces, utilized information operations in conjunction with the application of firepower and maneuver to achieve an overwhelming victory. By analyzing the impact of information operations on the outcome of Operation DESERT STORM, certain basic and critical concepts can be examined. First, what aspects of information operations were conducted in support of DESERT STORM based on the specific components of IO in existence during that time? Were these actions coordinated and integrated into the campaign plan to achieve maximum synergistic effects? What impact did the IO have on the success of the coalition operation and the failure of the

Iraqi defense and counter-attacks? By framing the analysis in this manner, limited conclusions applicable to the study of information operations can be made.

Coalition forces prepared for months to conduct the decisive counterattack to repel Iraqi forces from Kuwait. The Iraqi Army opposed them in the theater with 29 infantry divisions, 3 mechanized divisions, 5 tank divisions, and 6 Republican Guard Divisions (armored and mechanized). [33] These veteran, Soviet equipped forces defended from within prepared positions protected by hundreds of miles of barbed wire, millions of mines, oil filled trenches, and bunkers. The commander of the US led forces, General Norman Schwarzkopf, believed that the coalition could not depend on their great naval and air superiority to assure a successful combined air/ground attack nor to prevent losses which many experts estimated would exceed twenty-thousand American casualties. [34] He demanded that his staff develop a strategy to prevent the Iraqi Army from massing its numerically superior land combat forces, including the Republican Guards divisions positioned northwest of Kuwait City, at the point of the main attack.

To overcome the Iraqi quantitative superiority the CENTCOM staff designed a campaign plan that would establish and maintain an operational advantage over the Iraqi forces by using information warfare. Intelligence provided by satellite and airborne systems and aggressive OPSEC/counterintelligence operations, integrated with the CENTCOM deception concept, assured the coalition forces of the surprise needed to allow a successful assault with minimum loss of life. While exploiting the information and intelligence systems to support their own command and control, the coalition would attempt to systematically deny the Iraqis the information they required to counter the assault. [35]

The initial offensive concept incorporated the work of Air Force Colonel John Warden and his "Checkmate" plans group, assigned to the Pentagon Air Staff. Immediately after the Iraqi invasion of Kuwait, they began to prepare a plan to dislodge the Iraqi forces from Kuwait using only air power. The plan, codenamed INSTANT THUNDER, envisioned an intense six day "air campaign" targeted against critical Iraqi military capabilities; these centers of gravity included Iraqi command and control networks, nuclear, biological, and chemical production facilities, power stations, and armament production sites. LTG Chuck Horner, the commander of the CENTCOM Air Component, adopted the Checkmate plan with some significant modifications. He felt that the plan was too ambitious and that Iraqi forces could not be defeated through air power alone. While incorporating the intense attacks against critical command and control targets, Horner added strikes against Iraqi ground forces; these attacks were designed to significantly attrit the defending divisions prior to the launch of the ground offensive. This modified plan eventually became the blueprint for the successful 30 day "air campaign." [36]

To compliment the air operations, the CENTCOM planning cell designed a coordinated deception and counter-reconnaissance operation which would cause the Iraqi High Command, and particularly Saddam Hussein, to allocate forces away from the point of the coalition main attack. The strategy was also calculated to make the Iraqi commanders believe that the actual coalition main effort would be a ground attack centered on the Wadi al Batin area, supported by an amphibious assault conducted by US Marines along the Kuwaiti coast. This strategy exploited Saddam Hussein's and the Iraqi commanders' preconceptions that the area east of the Wadi al Batin represented the most likely point of attack.

The US Central Command's plan was designed to capitalize on the joint force's information warfare capabilities. On 17 October 1990, General Schwarzkopf briefed LTG Peter de la Billiere, British Forces Commander, and LTG John Yeosock, US 3rd Army Commander. Both commanders felt that a two corps attack would be successful provided that it the main attack was conducted far enough west to bypass the Iraqi main defensive belt. They also pointed out that psychological operations and deception would help to "even the odds" by causing desertions and deceiving the Iraqis about the true location of the main effort. [37] All senior commanders, including General Horner, agreed that information operations should be an integral element of the coalition campaign.

The success of the deception operation and related actions resulted from the planning and coordination of a dedicated staff element in the CENTCOM Headquarters. Centralized coordination and control allowed the separate cover and deception activities to achieve maximum combined effects. The CENTCOM staff designed the counterintelligence and security operations to deny the Iraqis accurate information regarding true coalition intentions and to protect the deception activities; these elements included OPSEC, EW, and direct attack against critical C4I targets. The strategy involved integrated intelligence and PSYOPS necessary to provide false information to Iraqi intelligence apparatus and leadership. The planners melded these separate activities into one coordinated effort; information warfare. National level collection and processing systems provided most of the intelligence for planning and provided feedback necessary to monitor the results of each activity allowing the planners to make vital changes to the plan based on enemy reactions. [38]

The US overwhelming superiority in intelligence collection, processing, and dissemination, including unrivaled access to satellite intelligence, factored decisively in the

coalition victory. The desert conditions of the theater and the US military's dynamic use of all available technology facilitated the production of timely and accurate information determining enemy dispositions, capabilities, and intentions. Satellite systems furnished more detailed intelligence on the location and strength of enemy forces than any in any previous conflict. [39] Superior ground and air based collection systems, coupled with automated analysis and dissemination means, gave the coalition forces and commanders a definitive advantage in intelligence capability that proved critical to the campaign's outcome. [40]

The detailed information regarding Iraqi defenses provided to the coalition's tactical commanders contributes one clear example of the US intelligence dominance. During the desert campaign, the capabilities of the entire US intelligence system were focused on supporting the combat "war-fighters." National intelligence agencies provided intelligence directly in support of the corps and division ground commanders, a process rarely practiced during previous wars. The Intelligence and Threat Analysis Center (ITAC) produced a series of tactical templates. These detailed 1:50,000 tactical scale graphic overlays depicted individual tanks, armored vehicles, artillery positions, trucks, command posts, supply points, and Iraqi obstacle belts. These templates were accurate to within 400 meters and were updated by intelligence analysts located in Washington, DC daily. [41] While the unique desert conditions allowed this level of resolution to be achieved no other intelligence apparatus in the world could have accomplished this type of support to the front-line commanders. Iraqi operational overlays captured after the war indicated that the US forces maintained a clearer picture of the Iraqi force disposition than their own commanders. [42]

The US led coalition forces received intelligence from a wide variety of collection and processing systems. Satellites provided continuous coverage of Iraqi formations with

imagery and signals intelligence; national agencies passed this satellite data directly to corps and division command posts. Experimental systems, such as the Joint Surveillance Target Acquisition System (JSTARS), guaranteed all-weather collection against moving targets and imagery out to a range of 150 kilometers. Unmanned Aerial Vehicles (UAV) provided the division and corps commanders a direct support tactical system capable of collecting imagery and signals intelligence to a distance of 100 kilometers. Air Force aircraft, including U2 and RF-4C, supplied real time imagery and signals intelligence. In addition, each divisional military intelligence (MI) battalion and corps MI brigade contributed additional ground and air based signals intelligence systems, counterintelligence units, prisoner of war interrogation teams, and analytical capabilities. [43]

The Iraqi's intelligence system, in sharp contrast, was virtually nonexistent. They possessed no satellite systems of their own, nor did they receive access to real-time satellite data from outside sources. [44] Iraqi air and ground based collection systems were ineffective or had been destroyed by coalition precision strikes. What ineffectual intelligence the Iraqis received was gained by spies or from the global media coverage of the war; the coalition rendered the Iraqi intelligence system incapable of providing even a minimal level of support to the Iraqi command and control structure.

As CENTCOM deception operations progressed aerial and ground-based systems provided confirmation of the Iraqi reaction to the coalition plans. The intelligence gathered by aerial reconnaissance, satellite intelligence systems, and Special Forces Teams indicated that no reactionary troop movements or defensive preparations were occurring in western Iraq in response to the actual coalition invasion plan. [45] On the eve of the coalition ground offensive, General Norman Schwarzkopf held an accurate picture of the enemy situation,

strengths, and intentions; the Iraqi high command remained ignorant that the combined air/ground invasion from the west was about to begin. The US led coalition had achieved overpowering relative information supremacy.

The CENTCOM deception operations scheme incorporated communications and operations security actions to prevent the Iraqi intelligence system from gathering information on coalition preparation and movement. The CENTCOM Deception Staff recognized OPSEC as a critical component of the plan. They implemented offensive as well as defensive measures to ensure the maintenance of operational security.

At the outset of the offensive campaign, coalition air forces succeeded in defeating the Iraqi Air Force, which had provided a majority of their operational intelligence during the Iran-Iraq War. The Iraqi air forces were either destroyed, grounded, or had fled to Iran. CENTCOM conducted air operations specifically to destroy and disrupt the Iraqi air and ground based intelligence collection systems. Coalition ground units attacked border posts and conducted field artillery and helicopter raids to destroy Iraqi radar and signals intelligence collection sites. [46] These active measures, coupled with more defensive counter-reconnaissance screens and counterintelligence operations, prevented the Iraqis from obtaining a clear picture of the coalition troop movements and logistical preparation. This allowed the other aspects of the information operation, primarily deception and PSYOPS, to effectively feed the Iraqis carefully crafted false and misleading information.

The CENTCOM planners designed the deception operation to portray two primary notional threats to Iraqi forces in Kuwait. These two themes were carefully developed to build on the preexisting perceptions held by the Iraqi High Command, particularly Saddam Hussein. First, the deception indicated that the main attack by US and coalition forces would

take place in the west-central part of Kuwait and would not enter into Iraq. Second, the deception suggested that US forces would conduct an amphibious assault onto the eastern shores of Kuwait as part of any offensive designed to drive out the Iraqis. [47]

In one of the most effective deception activities, US Marines conducted a succession of well publicized amphibious exercises off the Kuwaiti coast to portray a significant threat to the eastern sector of the Iraqi defenses. Operation IMMINENT THUNDER, a series of Marine amphibious landing rehearsals and naval attacks against coastal targets, drew Saddam Hussein's attention towards the coast and away from the far western approaches into Kuwait. These operations continued after the actual ground offensive had been launched and reinforced Saddam Hussein's prejudgment that an amphibious assault would eventually occur. [48]

In concert with the Marine operations, VII and XVIII Corps made substantial efforts to portray US forces concentrating near the Saudi Arabian King Khalid Military City, which is located well to the east of where the actual main attack would occur. No US forces were positioned west of the Wadi al Batin area until after the air operations began and the US forces remained behind the Arab-Islamic forces until just before the attack commenced. VII Corps Commander, LTG Fred Franks, prohibited any maneuver forces and logistics bases from establishing positions west of the Kuwait/Iraq border until the latest possible time. The continued presence of US forces near the Wadi al Batin convinced Saddam Hussein that the main attack would occur there. To bolster this ruse VII Corps units conducted numerous artillery raids, helicopter attacks, and feints, including "berm busting" exercises in the deception main attack zone. Front line units, including the 1st Cavalry Division, conducted reconnaissance in force operations to portray offensive actions in the wadi area. The "main

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effort" of VII Corps prior to the launch of the actual ground assault was to support the deception. [49]

Based on the reaction of Saddam Hussein, positioning of Iraqi defensive forces, and reports from Iraqi prisoners of war the deception achieved the desired effects. Iraqi forces were oriented to the east and were surprised by the attack from the west; a majority of the forces were positioned to prevent an attack from the sea and coastal routes. The ruse persuaded Saddam Hussein not to reposition forces to the west against the main coalition effort.

A sophisticated coalition psychological operations campaign complimented the deception. PSYOPS severely undermined the capability of the Iraqi defenders. Coupled with the systematic destruction of Iraqi command and control, PSYOPS destroyed the Iraqi soldiers' will to fight. [50] Radio broadcasts and aerial delivered leaflets became as effective weapons against Iraqi forces as artillery, tanks, and aircraft; General Robert Scales remarks in Certain Victory, "The psychological operations campaign was another Special Operations success, one of the most important of the Gulf War." [51]

CENTCOM's 4th US PSYOPS group formulated 117 themes to target Iraqi soldiers and civilians. During the war the Air Force dropped 28 million leaflets over Kuwait and Iraq. In one type of operation, MC-130s would drop leaflets on an Iraqi unit announcing that it would be bombed. The leaflets told the Iraqis to desert to avoid being killed. That night B-52s would conduct air strikes against the targeted unit. A follow-up leaflet drop would then be made urging the same unit to desert. This PSYOPS technique had a tremendous effect on the morale and combat effectiveness of the Iraqi forces; ninety-eight percent of the Iraqi prisoners of war had surrender leaflets in their possession. One Iraqi front-line commander

reported the PSYOPS campaign was "second only to allied bombing in demoralizing his division." [52]

US forces effectively integrated PSYOPS into the operational ground maneuver as well. PSYOPS loudspeaker teams accompanied front line units urging Iraqis to surrender immediately before massive armored attacks were launched. These PSYOPS proved incredibly effective; thousands of Iraqi soldiers surrendered at the first possible opportunity. Many tried to surrender to the first coalition forces they encountered including attack helicopters and UAVs flying overhead.

CENTCOM information operations also employed electronic warfare to attack and neutralize the Iraqi command and control network as well as their intelligence acquisition systems. Coalition forces effectively integrated electronic jamming, deception, and precision strikes into the campaign plan to attack the enemy's technical information processing capabilities. The coalitions EW completely disrupted Iraq's command, control, communications, and intelligence (C3I) system. EW severed the command links from the Iraqi High Command in Baghdad to the corps headquarters in Kuwait. Electronic warfare also allowed the coalition to look deep into the "Iraqi operational and strategic depths, while denying them the same advantage, and the deception that accompanied the ground offensive was made possible by EW superiority." [53]

Coalition information warfare rendered Iraqi tactical and operational command and control ineffective. At the start of the ground campaign, captured Iraqi officers from the 25th and 26th Infantry Divisions reported that they had no contact with their Corps Headquarters for over a week. [54] At the tactical level, the Iraqi forces were unable to coordinate any division sized counterattacks against the US Seventh Corps forces. In the US 3rd Armored

Division zone, units of the Tawakalna Mechanized Division of the Republican Guards and the Iraqi 10th and 12th Armored Divisions of the Jihad Corps attempted to conduct delaying operations to protect the remainder of the Republican Guards Divisions which were fleeing into southern Iraq. These rear-guard operations were totally disorganized and uncoordinated. The Iraqi forces were unable to conduct anything larger than a brigade sized defense; the maneuver companies and battalions attacked piecemeal, largely without artillery support and lacking any early warning of the approaching US armor. There was no coordination between units located just kilometers apart. [55] US 1st Armored Division encountered a similar situation; during one attack they surprised an Iraqi armored unit that was preparing lunch, destroying over sixty T-72s and APCs with no friendly losses. [56] As the Seventh Corps rolled through the Iraqi defenses, the US armored divisions encountered no organized resistance above brigade strength.

Coalition air and naval forces directed an extensive EW campaign against Iraqi early warning radars, air defense radars, and C2 nodes. EW became an essential component of all air operations; during the campaign, the US air forces flew nearly 3000 electronic warfare missions. [57] Electronic warfare complimented direct attacks against key Iraqi command and control nodes, radar systems, reconnaissance aircraft, and lines of communication. These carefully targeted strikes of the Iraqi information system contributed to the success of the coalition deception and cover operations. Coalition air superiority provided the capability to assail critical Iraqi communications nodes; combined with accurate intelligence EW became an important element of the coalition offensive.

The extensive suppression of enemy air defense (SEAD) raids conducted on the first night of DESERT STORM indicates the potency of the coalition EW capabilities. Following

a successful attack on the forward Iraqi early warning sites by the US Army, coalition air

forces launched a raid aimed at destroying the Iraqi air defenses around Baghdad. Three

separate formations of jamming (EA-6B) and High Speed Anti-Radiation Missile (HARM)

aircraft with protective fighter cover were dispatched to Baghdad to attack the Iraqi Air

Defense network. Unmanned drones flew over the city to simulate the electronic signatures

of allied aircraft; this deception caused the Iraqi ADA command and control nets and surface

to air missile tracking radars to activate. As the Iraqi's radar activated to track the drones,

the HARM aircraft launched a barrage of missiles against them. These first night's missions

were judged to be approximately fifty percent successful. In addition to the physical damage

inflicted on the Iraqi air defense system, the raids diminished its effectiveness by intimidating

the Iraqi air defense operators; after the first night's attacks the Iraqi soldiers were hesitant

to turn on their radars for fear of another coalition strike. [58]

Coalition air and ground forces also conducted precision attack operations aimed at

destroying and degrading the Iraqi's intelligence and communications capabilities. Initial

offensive operations targeted the Iraqi's French built KARI Air Defense command and

control system. Elimination of this system would essentially blind the Iraqi air defense forces,

rendering the massive numbers of gun and missile anti-aircraft weapons ineffective.

A joint team of Army and Air Forces accomplished this vital task. US Army Apache

helicopters from the 101st Airborne Division conducted deep strikes to destroy Iraqi air

defense warning radars and command and control nodes. This attack opened an 6 mile wide

corridor in the Iraqi air defense umbrella, enabling the remainder of the air forces to conduct

successful attacks against critical C4I targets. Without early warning and command and

control nodes, the 600 Iraqi SAMs and 10,000 antiaircraft guns were much less effective;

lacking radar guidance or centralized control, the Iraqi weapons systems were forced to fire randomly into the air, normally after the coalition forces had already launched an attack. [59] During the first six days of DESERT STORM the coalition lost eight fixed wing aircraft; after the KARI network had been damaged the coalition lost only five more aircraft during the duration of the conflict. [60]

In addition to attacks against air defenses, key Iraqi unit headquarters identified by satellites and other intelligence means were subjected to precision strike. Prisoner of war reports indicate that attacks against headquarters had such a dramatic effect on the Iraqi commanders that they stopped using their radio communications. Front line armor and infantry units were forced to rely on messengers and wire to maintain contact between headquarters. Many Iraqi commanders prohibited the use of two way radios and strictly enforced the ban; unauthorized electronic communications could result in a penalty of death. Once the coalition ground attack commenced, the Iraqi forces could not report their situation to their higher headquarters, coordinate counter-attacks, nor direct artillery fires. The information attacks against their command and control network had forced the Iraqi's to commit what many intelligence analysts labeled as "EMCON (emissions control) suicide." [61] The Iraqis C2 network was rendered functionally ineffective without having to destroy each individual node.

The outcome of the four day ground offensive indicates that CENTCOM information operations attained positive results. The security and deception plan integrated intelligence, deception, operations security, PSYOPS, electronic warfare, and precision attack to create the conditions for a successful coalition attack. Ultimately the CENTCOM information warfare assured the coalition commanders possessed accurate information on which to base

sound operational decisions. Simultaneously it supplied the Iraqi commanders with distorted

and false information, while systematically destroying their command and control capabilities.

While the coalition had attained information dominance, how did CENTCOM

information operations influence the relative combat power of the opposing forces? Did

information warfare ensure the success of DESERT STORM by contributing more than just

support to the application of maneuver, firepower, protection, and leadership effects?

Consideration of these questions may establish the historical foundation for the development

of an updated combat power model, doctrinally based on sound "real world" evidence.

CENTCOM information operations created operational maneuver effects by

providing an overwhelming advantage to the coalition in terms of tactical analysis as well as

command and control capability. The coalition possessed superior knowledge of the enemy

intentions, terrain, and weather. This advantage allowed CENTCOM to mass their main

attack by the US Seventh Corps along a concentrated axis of attack while the Iraqis defended

a border and coastline hundreds of miles long. Additionally, the Iraqis had to position their

armored reserves to cover the most likely avenues of approach: the Kuwaiti coastline as well

as the Wadi al Batin approach located over 200 kilometers away. [62] The information

differential overcame a situation of Iraqi superiority in total force numbers. Information

operations continued to provide a maneuver advantage to the coalition during the four days

of the ground combat.

Satellite technology in the form of the Global Positioning System (GPS) produced

one key component of the coalition information dominance. This navigation device allowed

the US forces to maneuver across barren desert, without landmarks, and to know their

location to within 100 meters. The Iraqi High command had discounted the far western

avenues of approach as being untenable; they felt that no force could effectively move in the open desert. GPS enabled massive armored formations to maneuver at night, across the desert, and to maintain unit integrity and combat formation. Information, as force position awareness, produced maneuver effects. [63]

The coalition prevented the Iraqi forces from achieving operational maneuver effects by destroying their key command and control nodes. With communications either destroyed or effectively silenced by the threat of annihilation, the Iraqi High Command could not move combat forces around the battlefield. By the time the ground war commenced, much of the Iraqi operational and tactical command and control nodes had been wrecked. The Iraqi forces were unable to react to coalition attacks, to reposition and reorient artillery, or to conduct effective counterattacks. [64]

CENTCOM information operation achieved protection effects in two primary ways. First, by destroying the Iraqi early warning and air defense C2 capabilities, the coalition prevented the enemy from effectively defending against the coalition air operations. IO provided protection effects for the forces conducting interdiction and deep attacks in support of the campaign. Once the enemy radars and C2 had been destroyed, statistical analysis indicated that flying combat missions against Iraqi targets was only two to three times more dangerous than flying a peacetime training mission. [65] Second, by concealing the real main effort of the coalition, IO prevented the Iraqis from massing any potent response to the coalition ground attacks. This operational concealment prevented the coordinated commitment of Iraqi reserves, allowing the coalition to mass overwhelming combat power against CENTCOM's main operational objectives, the Republican Guards Armored and Mechanized Divisions. By portraying the Marine amphibious threat to the Kuwaiti coast for

over 50 hours after the actual ground attack commenced, the deception ensured that the weight of the Iraqi reaction was not directed against the main attacking coalition forces.

By negating the effectiveness of Iraqi intelligence and degrading their ability to command and control, CENTCOM information warfare accomplished operational concealment. This caused the Iraqi forces to position in response to the deception instead of against the actual threat. As late as 18-19 February, the Iraqi continued to reposition artillery and other forces, including 50-100 artillery systems, into the Wadi al Batin area. [66] The Iraqi High Command also repositioned infantry divisions into the eastern coastal sectors in response to the amphibious threat. They consistently maneuvered their forces into positions favorable to the coalition plan of attack. A great portion of the Iraqi preparatory effort went into coastal defenses. An Iraqi sand table discovered in Kuwait City indicated that they believed the main effort was going to come from the sea or up the Wadi al Batin. No other attacks axes were seriously considered. Iraqi reserves were positioned in central Kuwait to deal with the coastal threat and in the Wadi al Batin area to deal with the perceived threat to that area. [67]

The limited number of coalition casualties dramatically illustrates the decisive nature of the protection effects derived from information operations. The coalition forces overcame a four to three Iraqi advantage in tanks and a five to three superiority in artillery. [68] Instead of the thousands of casualties projected by CENTCOM planners or the 10 to 20 percent losses projected by the 18th Airborne commander the coalition suffered less than 200 combat losses. [69] The coalition forces completely routed the Iraqi Army; in less than 100 hours of ground combat coalition forces destroyed or captured more than 3000 tanks, 1400 armored

personnel carriers, and 2200 artillery pieces and caused tens of thousands of Iraqi casualties. [70]

Besides enhancing maneuver and protection, IO enabled firepower effects by providing detailed and timely intelligence to the coalition forces allowing them to effectively conduct precision attacks against carefully selected enemy targets. Satellite intelligence systems enhanced the acquisition of crucial targets, improving the overall precision of offensive operations. Critical targets were hit at the precise time to have maximum disruptive and destructive effects against the Iraqi command and control and counterattacking forces.

In one significant episode, the battle for Khafji, JSTARS detected movement of a large Iraqi mechanized force attempting to attack into northern Saudi Arabia. The coalition intelligence systems quickly identified the three columns moving south and determined the number of enemy vehicles involved; the intelligence clearly indicated the enemy's intentions to attack Khafji. This information was immediately passed to the CENTCOM air component and Marine ground forces commanders who were able to successfully target the enemy columns. Air attacks destroyed the majority of two enemy brigades, while ground fires destroyed the remainder. Timely, accurate intelligence effectively established conditions for the coalition to mass overwhelming firepower effects. [71]

Aerial and satellite intelligence systems, including J-STARS, provided detailed information and warning regarding Iraqi convoy movements and repositioning of Iraqi reserves. These targets were forwarded to the coalition air forces providing direct support to the US and coalition ground units. The air forces conducted fighter-bomber attacks against the Iraqi formations with accurate intelligence of their locations, routes of movement, and identification of the enemy reserves. Acting on real-time target intelligence from JSTARS,

coalition aircraft attacked and destroyed large columns of Iraqi vehicles attempting to withdraw from Kuwait City; battle damage assessments later confirmed over fifteen hundred vehicles destroyed on the roads leading out of Kuwait. [72] These operations produced such devastating results that Iraqi movement effectively ceased during daylight hours and were hampered at night.

Finally, information warfare facilitated leadership effects by providing accurate information to coalition leaders while denying this information to the Iraqi High Command. General Schwarzkopf's ability to make the decision to attack on 28 February, 24 hours earlier than planned, best illustrates the decisive informational advantage enjoyed by the coalition forces. Superior intelligence and data collection capabilities produced accurate information regarding the breakdown of Iraqi defenses in Kuwait resulting from the initial Marine attacks. The CENTCOM staff combined this information with detailed and accurate intelligence regarding the status of Iraqi defenses supplied by satellite systems. Schwarzkopf made his decision to launch the Seventh Corps main attack based on a clear picture of the enemy situation, knowledge of the weather and terrain, and confidence in the results of the CENTCOM deception operation.

Coalition attacks on Iraqi command and control nodes and signals communications jamming ensured the Iraqis did not have warning of the coalition attacks. Information, specifically the Iraqi lack thereof, played a critical role in the success of the DESERT STORM Operation. While the Iraqi army possessed greater numbers of combat systems they were incapable of effectively applying their firepower and maneuver effects against the coalition. As Norman Friedman writes in Desert Victory, "[Saddam Hussein] was unable to buy or to maintain a modern command-and-control system to back up that outward power.

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It is possible that Saddam's failure to appreciate the importance of command and control was the key to his defeat in the war that followed." [73]

While the elements of information warfare contributed to the effects of operational combat power arguably their greatest contribution was the added benefit achieved through their coordinated application. The centralized planning and decentralized execution CENTCOM information operations enabled the elements of IW to produce decisive results in and of themselves. The coalition commanders had accurate information with which to make sound decisions regarding the application of operational firepower, maneuver, and protection. The Iraqis, lacking accurate information, made erroneous decisions regarding the application of all aspects of combat power. The relative scale of operational combat power effects was tipped decisively in the coalition's favor.

CENTCOM leveraged the synergistic effects of intelligence dominance, deception, OPSEC, PSYOPS, EW, and selective targeting of key Iraqi to conduct the offensive to free Kuwait. Information dominance created the conditions that enabled the overwhelming victory with minimum losses. The contribution made by information operations far exceeded simple support to the firepower and maneuver. Operational combat power was achieved during the Iraq/Kuwait campaign through the employment of leadership, protection, firepower, maneuver and information effects. This dynamic created a new paradigm in operational combat power that may be applied to developing doctrine to fight wars of the future. Major Michael Schneider, describing the emergence of information warfare on the modern battlefield writes:

> Overmatch through information operations and dominance at the operational level set the conditions for tactical forces to be at the right place on the battlefield with overwhelming combat power at the point of impact. . . . One of the outcomes of our emphasis on information warfare and integrative technology is that we will calculate

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required force ratios differently. We will expect to get more combat power out of smaller forces. [74]

Desert Storm proved for the first time that "modern wars may be won through the effective use of command, control, communications, computers and intelligence (C4I) technology." [75] US information dominance rendered the Iraqi Army largely combat ineffective before ground operations commenced. The thirty day "Air Campaign" and information warfare operations established conditions for the overwhelming hundred hour ground offensive. Operational combat power resulted as much from the effects of information operations as from firepower and maneuver. DESERT STORM represents the shift from firepower and maneuver based combat power to a model that includes information warfare as a coequal component.

SECTION IV--CONCLUSIONS AND RECOMMENDATIONS: THE INFORMATION BASED COMBAT POWER MODEL.

In the 1993 Gulf War Air Power Survey, the authors note that four conditions must be met for a true revolution in military affairs to occur. First, the development or maturation of new technologies must take place. Second, these emerging technologies have to be integrated into a new military system. Third, operational concepts for employment of these new systems should be developed and implemented. Finally, an organizational adaptation must occur. [76] The question then remains; did the conduct of information operations during DESERT STORM constitute the precursor to a revolutionary way of warfare, and if so, how well is the Army currently adapting to exploit this revolution?

Clearly, information technology played a pivotal role during the conflict. Satellite intelligence and communications platforms, stealth aircraft, precision munitions, GPS, and automated data processing systems contributed to coalition success at all levels. These

technologically advanced systems were integrated into a variety of military equipment; GPS was mounted in most armored combat vehicles and aircraft, computer C2 and fire control systems, and satellite communications were integrated down to battalion level. The ability to collect, process, analyze, store, and use a staggering amount of combat information existed as never before; equally, the ability to deny the enemy use of this information contributed significantly to the success of the operation. The capabilities afforded by these technology-based systems enhanced the effectiveness of many more traditional actions, such as the coalition deception and PSYOPS, by providing the information to enhance and exploit their effects.

The revolution remains incomplete, however, when scrutinized from the stand point of operational theory; the Army's foundation doctrine must still transform to realize the revolutionary change. While DESERT STORM demonstrated the capacity of new technologically based information capabilities to dominate the modern battlefield, the US Army must now establish the overarching doctrine necessary to efficiently exploit this information potential. As Keaney and Cohen write, "Technology alone does not a revolution make; how military organizations adapt and shape new technology, military systems, and operational concepts matter much more." [77]

DESERT STORM was an overwhelming success for US forces, however, the Army cannot afford to become complacent. While the original concept of combat power was successfully applied to win that war, it may not be adequate to ensure success in the future. The environment of conflict, the impact of technology, and the structure of the US Army have changed so dramatically over the past five years that our doctrine is quickly becoming obsolete. We must now develop a new doctrinal foundation that encompasses the nature of

future warfare. As FM 100-5 states, "Doctrine captures the lessons of past wars, reflects the nature of war and conflict in its own time, and anticipates the intellectual and technological developments that will bring victory now and in the future." [78]

The Army has gone from 18 Active Divisions and 751,000 soldiers in FY 1990, just before the Gulf War, to fewer than 485,000 soldiers and 10 active divisions. [79] The US Army is physically incapable of conducting an operation of the same scale as the Gulf War, therefore, the Army must generate more combat power per division than in the past. Meanwhile, the basic weapons remain the same; there have been no major modifications to firepower or maneuver aspects of the M1 Tank, the M2 Bradley Infantry Fighting Vehicle, nor the Apache Attack Helicopter. The major changes that have been made to these systems involve information technology. The Army is attempting to make these systems more potent through better information integration and efficiency. The task that remains is to determine how to achieve the most combat power from these "informationally-enhanced" systems:

> The incorporation of state-of-the-art information technology, to include space-based systems, into battle command allows us to concentrate effects rather than forces; thereby enabling smaller units to be both more survivable and lethal. It is comparable to the introduction of wireless radio integrated into tracked combat vehicles in land warfare. It affords combat forces the capability to be proactive despite an accelerated tempo which demands faster decisions, instant communications, and instant response. . . . its revolutionary approach to warfare, rather than the previously slow, grinding collision of forces. Warfare based on leap-ahead information technology will result in a larger payoff in operational effectiveness than simply increasing firepower. [80]

The Army has begun the process of self examination and transformation, attempting to define the emerging ideas that will move the force into the future. TRADOC Pamphlet 525-5 provides the central ideas regarding the Army of the 21st century and represents the precursor to the next generation of FM 100-5. [81] The notion of conceptual change is also documented in the US Army blueprint for prospective force structure, the Force XXI Plan:

We will accomplish this [increased capability] through the application of advanced information-age technologies across existing weapons systems. By enhancing the information component of these families of systems, this program--known as horizontal technology insertion--will produce synergistic effects in equipment capability, performance, and overall combat power. . . . The second and more critical step is to make the complete transformation to an information-based Army. Such a transition requires that we make fundamental changes in how we gather, analyze, distribute, and act on information. [82]

Each of the Force XXI documents recognizes that "information technology will greatly increase the volume, accuracy, and speed of battlefield information available to commanders." [83] They envision a smaller, more mobile, and highly lethal Army, dependent on precision strike capabilities and non-hierarchical battle command. [84] This force will conduct simultaneous attacks throughout the depths of the enemy's battlespace overwhelming the enemy's ability to react and quickly causing the enemy's collapse. In addition, both friendly and enemy casualties must be minimized and collateral damage will be significantly reduced. Each of these future warfighting dynamics depends on information dominance for success; the same conditions must be present on the future battlefield that allowed the overwhelming victory by US and coalition forces during the Gulf War.

The analysis of Operation DESERT STORM highlights the increasing importance and impact of information operations on modern conflict and marks a significant shift in the application of information warfare during combat. DESERT STORM was the first information war, one dominated by computers, satellites, and communications. The US Central Command leveraged information operations in conjunction with the application of firepower and maneuver to achieve an overwhelming victory. The combined ground and air force's information operations constituted "the first campaign in the era of knowledge based warfare." [85]

As the Army physically reshapes itself into Force XXI, an Army capable of fighting and winning future wars, it must continue to reinvent itself doctrinally to fully exploit the capabilities afforded by the modern information environment. These changes must affect the Army's central conceptual foundation embodied in the capstone manual for all operations, FM 100-5. More specifically the notion of Combat Power must undergo a knowledge based modification to bring it in line with technological change.

The historical case study provides the groundwork for a consideration of the role information plays in the current Army Combat Power Model. Analysis of the contemporary combat power model, the historical examination of information operations, combined with an overview of emerging concepts developed to support Force XXI affords a thorough basis for establishing a new framework. This allows for development of a new model, updating the original paradigm detailed in Colonel Huba Wass de Czege's 1984 Understanding and Developing Combat Power. Desert Storm historical analysis contributes to the examination of Colonel Wass de Czege's theoretical constructs by providing an analysis of the "real-world" application of his ideas. This study proves that information operations have fundamentally changed the basis for the combat power model and argues for the development of a new paradigm.

A new combat power model emerges with Information Operations becoming the fifth component of combat power: a detailed analysis using Wass de Czege's methodology supports this doctrinal change. The updated model includes the second and third tier factors, providing a detailed rationale for each element of the IO function. Optimally, the updated paradigm provides the basis for continued discussion, analysis, and debate within the Army, as we struggle to meet the challenges of Information Age conflict.

The knowledge based model incorporates information operations as an equal, fully

distinct, and integrated component of relative combat power. Building on the original

paradigm introduced by Huba Wass de Czege in 1984, the updated equation form of the

model can be constructed incorporating the full effects of emerging information warfare

capabilities:

THE RELATIVE INFORMATION BASED COMBAT POWER MODEL

$$L_f(I_f+F_f+M_f+S_f-D_e) - L_e(I_e+F_e+M_e+S_e-D_f) = \text{The Outcome of Battle}$$

L_f - friendly leadership effect	L_e - enemy leadership effect
I_f - friendly information effect	I_e - enemy information effect
F_f - friendly firepower effect	F_e - enemy firepower effect
M_f - friendly maneuver effect	M_e - enemy maneuver effect
S_f - friendly survivability effect	S_e - enemy survivability effect
D_e - enemy degrading of friendly	D_f - friendly degrading of enemy
(Information, firepower, maneuver and survivability effects)	(Information, firepower, maneuver and survivability effects)

Leadership remains as the most dynamic essential of combat power. In the fast paced

information based environment leaders must still provide purpose, direction and motivation,

determining how each of the other elements of combat power will be applied on the

battlefield; they must be able to do so at a much faster pace than ever before and with access

to a much greater quantity of information on which to base decisions. Effective leadership on

the battlefield depends on the commander's ability to apply his technical proficiency,

understanding of unit capabilities, analytical skills, communications skills, moral force, and

understanding of battlefield effects at critical times and places.

Likewise, the foundation elements of maneuver, firepower, and protection remain as

critical elements of combat power. The requirement to position combat forces, to deliver

maximum firepower effects, and to preserve the fighting potential of a force will continue to

exist as critical factors in warfare. As the DESERT STORM case study analysis illustrates, the application of these elements now and in the future will depend more on the information dynamic than ever before.

The inclusion of information as an equal component of combat power enhances the effectiveness of their synergistically combined effects. Information operations provide the critical advantage in the form of time and tempo, allowing the commander to maximize the effects of his forces at the critical place and time. FM 100-6 states, "Information Operations integrate all of a unit's information assets and capabilities, with elements of combat power, to achieve information dominance in situations across the range of operations." [86] In this example, information assets and capabilities are considered as separate and closely related to the elements of combat power.

FM 100-6, FM 34-1, TRADOC Pamphlet 525-5, and the Force XXI Blueprint provide the detailed foundation on which to build the information component and to develop its subordinate functions. These documents indicate that the information element provides combat power effects in three primary ways. It facilitates the achievement of combat power effects through battle command. This function primarily relates to information systems capabilities and the information environment. In addition, effects are derived through the command and control warfare dynamic: this is the unit's ability to conduct counter-command and control, command and control protection, and C2 integration. Finally, IO enhances combat power through the functional application of the unit's intelligence capabilities. Intelligence capabilities result from planning and direction, collection capabilities, information analysis, intelligence production, and intelligence dissemination.. The systematic application

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of these interrelated components produces the informational element of combat power. [87] (See Appendix 2 for the detailed Information Based Combat Power Model.)

Battle command and information battlespace are critical sub-functions of IO. Battle command support provides the commander with the capability to "obtain the information he needs through an integrated information system that supports the chain of command." [88] This component includes those procedural aspects of battle command that effect collection, management, and dissemination of data. The information environment relates to the technical and physical conditions present; included are the commander's information battlespace, equipment capabilities, soldier proficiency, and information systems capabilities. The commander exploits the technical and procedural elements of his Information System to achieve information effects through information engagement.

C2W allows the commander to "intercept and locate, delay, deny, and distort the information used by the enemy while protecting his own capabilities." [89] C2W engagement encompasses counter-command and control, which uses EW, deception, PSYOPS, and physical destruction to disable the enemy C2 system. It also includes those activities undertaken to protect friendly C2 to include OPSEC, INFOSEC, and counterintelligence. Finally, engagement incorporates the means available to the commander and the doctrine for information engagement employment to produce the desired IO effect. This also ensures that engagement is conducted to best support the commander's battle command operations. [90]

Intelligence supports both battle command and C2W by providing a thorough understanding of the enemy, his C2 system, and the enemy decision making process. Intelligence allows the commander to create and exploit vulnerabilities in the enemy's C2 system. This improves the friendly commander's knowledge base while degrading the

quantity and quality of information available to the enemy. Intelligence capability is a function of the commander's ability to plan and direct his intelligence assets; it is also a function of the unit's collection, analysis, and dissemination capability. Intelligence is essential to conducting successful IO, resulting in information dominance and producing combat power effects. [91]

The intellectual struggle to change our doctrinal identity must be waged to ensure the Army will be capable of facing the challenges of future warfare. As Eliot Cohen and John Gooch write in their study of failure in warfare, Military Misfortune, there are three ways that armies have traditionally failed to prepare themselves for future conflict. In the section titled, "The Taxonomy of Misfortune," the authors write: There are three basic kinds of failure: failure to learn, failure to anticipate, and failure to adapt . . . When all three kinds of failure occur together, catastrophe results." [92]

The development of a suite of visionary doctrinal manuals and pamphlets, including FM 100-6, TP 525-5, and the Force XXI Plan, indicates that the US Army is seeking to avoid catastrophe by applying the lessons of past conflicts; that information can be a decisive element of operational art. These documents indicate that the leadership of the Army is anticipating the requirements of future conflict, and is adapting force structures to fight and win the next war. The next step is to adopt the forward looking concepts contained in these cornerstone manuals into the Army's capstone doctrine, FM 100-5. The manifestation of this intellectual change will be the Army of the future; one that successfully adapts itself both mentally and physically to meet the challenges of information age conflict. Adopting the knowledge based combat power model further stimulates such growth and ultimately leads the Army into the age of Knowledge Based Warfare.

Appendix 1. THE RELATIVE COMBAT POWER MODEL
(WASS de CZEGE MODEL, February 1984)

COMBAT POWER IS A FUNCTION OF:

1. FIREPOWER EFFECT: (which is a function of)

   Volume of Fire: (which a function of)
           Number of Delivery Means
           Supply Capability
           Rate of fire of weapons systems

   Lethality of Munitions
           Design Characteristics
           Explosive Energy

   Accuracy of Fires
           Weapon and munitions design
           Crew Proficiency
           Terrain effects
           Visibility

   Target Acquisition
           Intelligence and intelligence analysis
           Location and functioning of observers
           Transmission of target data

   Flexibility of Employment
           Weapons ranges
           Mobility
           Signature Effects
           Fire Control Systems
           Tactical Employment doctrine

2. MANEUVER EFFECT:

   Unit Mobility
           Physical Fitness and health
           Unit teamwork and esprit
           Unit equipment capabilities
           Unit equipment maintenance
           Unit mobility skills

   Tactical Analysis
           Intelligence and Knowledge of enemy
           Understanding of terrain effects

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Understanding of own unit capabilities

Management of Resources
       Equipment Utilization
       Supplies Utilization
       Personnel Utilization
       Time Utilization
       Utilization of Energies of Subordinates

Command, Control and Coordination
       Span of Control
       SOPs and Doctrine
       Staff Efficiency
       Communications Efficiency

3. PROTECTION EFFECT:

Concealment
       Camouflage
       Stealth
       Equipment Design
       Counter enemy intelligence acquisition

Exposure Limitation
       Minimize potential target size
       Minimize potential target exposure
       Complicate potential target tracking

Damage Limitation
       Individual protective equipment design
       Use of Natural Cover
       Use of Artificial Cover
       Combat vehicle design
       Medical treatment and evacuation system
       Combat equipment cannibalization
       Alternate C2 Arrangements
       Providing Replacements
       Misc. efforts to maintain combat effectiveness of units

4. LEADERSHIP EFFECT:

Technical Proficiency
       Training
       Experience

Understanding of Unit Capabilities

Training
Experience

Analytical Skills
        Selection
        Training
        Experience

Communication Skills
        Selection
        Training

Dedication, Commitment, & Moral Force
        Selection
        Motivation

Understanding of Battlefield Effects
        Combat Experience
        Training

*Note the significant number of components and sub-components which are elements of information operations.

Appendix 2. THE *INFORMATION BASED* RELATIVE COMBAT POWER MODEL
(Based on the WASS de CZEGE MODEL, February 1984)

The knowledge based model does not eliminate any of the base components of the original model. Information effects are added as a fifth component and specific information oriented functions are included. Information functions are also integral to the firepower, maneuver, protection, and leadership elements and are therefore included in those functions as appropriate. There will be some degree of overlap within the information dynamic, as it is one element of combat power that impacts significantly on all the others. The components of the Information Effects function are based on current and proposed doctrine found in FM 100-6 and FM 34-1.

COMBAT POWER IS A FUNCTION OF:

1. INFORMATION EFFECT: (which is a function of)

Battle Command: (which a function of)

Information Systems Support Capability
Span of Control
SOPs and Doctrine
Staff Efficiency
Communications Architecture Efficiency

Information Environment
Information Battlespace
Operational Information Environmentr
C4I equipment design
Crew/Operator Proficiency
Rate of data processing of information systems

Command and Control Warfare Capability

Counter Command and Control (Counter-C2)
EW
Deception
PSYOPS
Physical destruction

C2 Protection
OPSEC
INFOSEC
Counter-intelligence

C2 Integration
C2 Employment Doctrine

C2 means

Intelligence Capability:

> Planning and Direction
>> Commanders CCIR
>> IEW Synchronization

> Collection Capabilities
>> HUMINT Capability
>> IMINT Capability
>> SIGINT Capability
>> MASINT Capability
>> TECHINT Capability

> Information Analysis
>> Knowledge of the enemy
>> Knowledge of the terrain
>> Knowledge of the weather

> Intelligence Production
>> All-Source integration capabilities
>> Production equipment design
>> Crew/Operator Proficiency
>> Rate of production

> Dissemination
>> Broadcast Capabilities
>> Tactical Tailoring of Assets

2. FIREPOWER EFFECT: (which is a function of)

> Volume of Fire: (which a function of)
>> Number of Delivery Means
>> Supply Capability
>> Rate of fire of weapons systems

> Lethality of Munitions
>> Design Characteristics
>> Explosive Energy

> Accuracy of Fires
>> Weapon and munitions design
>> Crew Proficiency
>> Terrain effects
>> Visibility

Target Acquisition
        Intelligence and intelligence analysis
        Location and functioning of observers
        Transmission of target data

Flexibility of Employment
        Weapons ranges
        Mobility
        Signature Effects
        Fire Control Systems
        Tactical Employment doctrine

3. MANEUVER EFFECT:

Unit Mobility
        Physical Fitness and health
        Unit teamwork and esprit
        Unit equipment capabilities
        Unit equipment maintenance
        Unit mobility skills

Tactical Analysis
        Intelligence and Knowledge of enemy
        Understanding of terrain effects
        Understanding of own unit capabilities

Management of Resources
        Equipment Utilization
        Supplies Utilization
        Personnel Utilization
        Time Utilization
        Utilization of Energies of Subordinates

Command, Control and Coordination
        Span of Control
        SOPs and Doctrine
        Staff Efficiency
        Communications Efficiency

4. PROTECTION EFFECT:

Concealment
        Camouflage
        Stealth
        Equipment Design

Counter enemy intelligence acquisition

Exposure Limitation
        Minimize potential target size
        Minimize potential target exposure
        Complicate potential target tracking

Damage Limitation
        Individual protective equipment design
        Use of Natural Cover
        Use of Artificial Cover
        Combat vehicle design
        Medical treatment and evacuation system
        Combat equipment cannibalization
        Alternate C2 Arrangements
        Providing Replacements
        Misc. efforts to maintain combat effectiveness of units

5. LEADERSHIP EFFECT:

Technical Proficiency
        Training
        Experience

Understanding of Unit Capabilities
        Training
        Experience

Analytical Skills
        Selection
        Training
        Experience

Communication Skills
        Selection
        Training

Dedication, Commitment, & Moral Force
        Selection
        Motivation

Understanding of Battlefield Effects
        Combat Experience
        Training

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3. US Army, <u>FM 100-6, Information Operations (Initial Draft)</u>, (Washington, DC: Department of the Army, 1994), p. 1-1.

4. US Army, <u>FM 100-5, Operations</u>, (Washington, DC: Department of the Army, 1993), p. 1-1.

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6. US Army, <u>TRADOC Pamphlet 525-5, Force XXI Operations--A Concept for the Evolution of Full-Dimensional Operations for the Strategic Army of the Early Twenty-First Century</u>, (Fort Monroe, VA: Headquarters, Army Training and Doctrine Command, 1994), p. 4-2.

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8. <u>FM 100-6</u>, p. v.

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10. Joint Chiefs of Staff, <u>JP 3-0, Doctrine for Joint Operations</u>, (Washington, DC: The Joint Chiefs of Staff, 1995), p. III-26.

11. <u>FM 100-5</u>, p. 2-12.

12. <u>FM 100-6</u>, p. 5-1.

13. US Army, <u>AR 530-1, Operations Security (OPSEC)</u>, (Washington, DC: Department of the Army, 1995), p. 4.

14. US Army, <u>FM 90-2, Battlefield Deception</u>, (Washington, DC: Department of the Army, 1988), p. 1-3. The key components of deception operations are the objectives, target, story, events, and the coordinated plan. The objective is the action or lack of action the enemy must take at the right time and place on the battlefield to support the friendly commander. The target is the enemy commander who will make the required decision to act or not. To influence the enemy commander, the story must be believable and collectable by the enemy intelligence system. The events are the specific friendly actions that will be used to support the story; all the above listed factors are part of a coordinated and synchronized plan or set

of plans.

15. FM 90-2, p. 1-4 to 1-25.

16. US Army, FM 33-1, Psychological Operations, (Washington, DC: Department of the Army, 1993), p. 1-2.

17. US Army, FM 34-1, Intelligence and Electronic Warfare Operations, (Washington, DC: Department of the Army, 1994), p. 2-20.

18. FM 34-1, p. 2-20 to 2-22.

19. FM 100-6, p. 4-53. Sensors include RSTA assets. Processors are human and automated data storage and analysis systems. Communications means signal assets. C2 nodes are command posts.

20. Norman B. Hutcherson, Command and Control Warfare--Putting Another Tool in the War-fighter's Data Base, (Maxwell Air Force Base, AL: Air University Press, 1994), p. 28. FM 100-6 defines Information Dominance as a relative advantage between the friendly commander's decision process and that of the adversary and the use of that advantage to enhance and enable the elements of combat power. Information operations are an essential foundation of knowledge-based, combined arms warfare.

21. FM 100-5, p. 2-9.

22. David Boslego, The Relationship of Information to the Relative Combat Power Model in Force XXI Engagements, (Ft Leavenworth: US Army Command and General Staff College, 1995), p. 2.

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25. FM 100-5, p. 2-10.

26. WASS de CZEGE, p. 12-14.

27. FM 100-5, p. 2-10.

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42. Fontenot, p. 2.

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46. US Army, <u>Operation Desert Shield/Desert Storm: Center for Army Lessons Learned --
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49. Swain, CHR-006, p. 5.

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62. Swain, p. 249.

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